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SYNOPSIS OF *OLDENLANDIA* (RUBIACEAE) IN THE UNITED STATES

Edward E. Terrell
Department of Botany, University of Maryland, College Park,
Maryland 20742 U.S.A.

ABSTRACT

A synoptic taxonomic treatment for *Oldenlandia* (Rubiaceae) is provided for five species occurring in the United States, including data on generic differences, keys to species, synonyms, brief descriptions, and habitats and distributions. Two of the species, *O. boscii* and *O. uniflora*, are native, and three species, *O. corymbosa, O. salzmannii* and *O. callitrichoides*, are adventive.

KEY WORDS: *Oldenlandia*, Rubiaceae, systematics, United States.

This synopsis provides a generic description of *Oldenlandia*, data on generic differences, keys to species, synonyms, brief descriptions, and habitats and distributions. These data are intended to provide a body of useful taxonomic information for this genus pending completion of a more detailed taxonomic treatment. Five species of *Oldenlandia* are included, of which two are native to the United States and three are adventive.

Oldenlandia (tribe Hedyotideae; Rubiaceae) is a worldwide genus of warm, subtropical and tropical regions. Verdcourt (1976: 269) estimated the genus to have nearer 100 species, instead of the 300 sometimes estimated (*e.g.*, Willis 1973). Most of the species are native to Africa, with smaller numbers in Asia, Australia and the Americas. Bremekamp (1952) in his extensive monograph of African species of *Oldenlandia* treated 61 species arranged in 16 subgenera and also dealt with 19 other genera more or less closely related to *Oldenlandia*. Authors of recent African floras recognized 12 *Oldenlandia* species in West Tropical Africa (Hepper & Keay 1963), 7 species in Gabon (Hallé 1966) and 37 species in Tropical East Africa (Verdcourt 1976). These authors did not recognize the occurrence of *Hedyotis* species in their regions, and Hallé (1966) commented that *Hedyotis* is an Asian genus.

Since 1753, the closely related Linnaean genera *Hedyotis, Houstonia* and *Oldenlandia*, have been subjected to the shifting opinions of many systematic botanists; some of this literature was reviewed by Fosberg (1943) and Bremekamp (1952). Verdcourt (1976: 269), while treating *Oldenlandia*, cited recent literature on these genera, including papers by Fosberg (*e.g.* 1943) and

Lewis (1961) that favored the union of these genera under *Hedyotis*. Later however, Lewis (1964, 1965, 1966b) recognized *Oldenlandia* as a distinct genus, while providing chromosome and pollen data. Verdcourt (1976: 269) commented that "If all the genera closely related to *Hedyotis* are sunk into it, then it forms an unwieldly unit covering a very wide range of structure and habit." Terrell (1975) expressed a similar viewpoint while pointing out the strong differences in the type species of the three genera; he did not, however, provide details concerning the total variation. Data concerning seed types, chromosome numbers and pollen morphology were furnished for 39 North American species of *Houstonia* (Terrell, *et al.* 1986). Since 1986 I have concluded that putting most of the North American species in *Houstonia* is as wrong as placing them all in *Hedyotis*. At present, I recognize for North America, approximately 20 species in *Houstonia* (a genus restricted to North America), 20 species in *Hedyotis* (with most species in Asia) and 10 species in *Oldenlandia* (excluding West Indies species). Further data regarding all three genera are being summarized in a subsequent paper.

The *bona fide* species of *Oldenlandia* have the following principal characteristics: small annual or perennial herbs; corollas small, usually less than 8 mm long, rotate or more or less funnelform or salverform; homostylous or heterostylous; capsules more or less subglobose, 4/5 to fully inferior; seeds minute (typically 0.2-0.4 mm long), numerous (usually 50-150) per capsule, trigonous or conic in shape, hilum punctiform at apex of an angle, testa minutely reticulate, areole walls straight or sinuous, often low and indistinct; chromosome number $x=9$. The seed characters and chromosome number especially distinguish *Oldenlandia* from *Hedyotis* and *Houstonia*. (The chromosome number $x=9$ occurs otherwise only in *Hedyotis nigricans*, which has much larger, compressed-ellipsoid seeds and other morphological differences indicating that it represents a separate phyletic line). Two of the species included here do not have these strictly oldenlandioid seed characters and chromosome number, but they have generally been included in *Oldenlandia* in the past and one of them (*O. salzmannii*) is tentatively retained there pending further study. Both clearly are different from *Houstonia* and *Oldenlandia*, so cannot be placed in those genera. The second species, *O. callitrichoides* Griseb., is being described by Terrell and W.H. Lewis as a new genus and is included here only to facilitate its identification.

The following generic description is based largely on the species included here (except *O. callitrichoides*). Also taken into account were the descriptions by Bremekamp (1952) in his monograph of African *Oldenlandia* and Standley (1918) in his treatment of the genus for the North American Flora.

GENERIC DESCRIPTION

Oldenlandia L., *Sp. Pl.* 119. 1753. LECTOTYPE SPECIES: *O. corymbosa* L., selected by Hitchcock & Green (1929).

Small annual or perennial herbs. Stems slender, erect, decumbent or creeping. Leaves opposite, sessile or petiolate. Stipules interpetiolar, small. Flowers small, in axillary or terminal glomerules or in cymes or solitary, homostylous (isostylous) or heterostylous (distylous), sessile or pedicellate. Calyx lobes (3-) 4(-5): calyx cup (hypanthium) cup shaped or hemispheric. Corollas 1-5(-8.5) mm long, rotate, funnelform or salverform, white, lavender, pink or purple, glabrous externally; tube shorter or longer than the (3-)4(-5) lobes. Stamens (3-)4(-5), anthers dorsifixed, sessile or on short filaments; filaments inserted on corolla tube at or below corolla sinuses. Stigmas 2 branched; styles filiform or thickened. Capsules small, bilocular, more or less subglobose, fused with calyx cup (hypanthium), 4/5 to fully inferior, loculicidally dehiscent or later also septicidally dehiscent. Seeds usually numerous (50-150) per capsule or in certain species ca 4-30 per capsule, black, brown or tan, minute to small, 0.1-0.4(-0.65 mm) long, usually trigonous or somewhat conic, or in certain species subglobose or oblongoid; hilum punctiform at apex of an angle or at apex of rounded ventral face; testa minutely reticulate; areole walls straight or sinuous, sometimes low and indistinct. Endosperm fleshy: embryo clavate (Standley 1918) or cylindrical. Basic chromosome number in many species $x=9$, in one species included here $n=15$.

KEY TO SPECIES

A. Flowers and capsules sessile or on pedicels to ca 3 mm long, 1 to several in terminal or axillary glomerules.

B. Annual; leaves ovate or elliptic, 3-11 mm wide; calyces and capsules hirsute to glabrous; stipules with conspicuous narrow, marginal, often branched and ciliate, teeth to ca 5 mm long .. 2. *O. uniflora*

B' Perennial with woody tap root; leaves linear to narrowly elliptic, 1-3(-5) mm wide; calyces and capsules minutely papillose or verrucose to glabrous; stipules with narrow marginal teeth to ca 2 mm long .... 3. *O. boscii*

A' Flowers and capsules on pedicels more than 3 mm long, not in glomerules.

C. Annual, erect, spreading, or decumbent; corollas inconspicuous, more or less obscured by calyx lobes .... 1. *O. corymbosa*

C' Perennial, creeping; corollas small but not obscured by calyx lobes.

D. Leaves broadly elliptic or ovate. 1.5-5.2 mm long, 0.7-2.5 mm wide, sessile or subsessile; corollas pink, purple or white, 2.5-5 mm long; capsules subglobose .... 4. *O. salzmannii*

D' Leaves suborbicular, subrhombic or broadly ovate, 0.5-4 mm long and wide, petioles 0.5-3 mm long; corollas white, 1.5-3.5

mm long; capsules narrowly turbinate or obconic .... 5. *O. callitrichoides*

SYSTEMATIC TREATMENT

1. *Oldenlandia corymbosa* L., *Sp. Pl.* 119. 1753. TYPE: To be discussed in a separate paper. *Hedyotis corymbosa* (L.) Lam., *Tabl. Encycl.* 1:272. 1792.

Small annual herb. Stems slender, erect, spreading, decumbent or prostrate, to 2.4(-4) dm tall, usually branched, glabrous or puberulent. Leaves sessile or short petiolate, narrowly elliptic, elliptic, narrowly oblong, or linear, 5-40 mm long, 1-9 mm wide, glabrous or leaf bases ciliate. Stipules to 2 mm long, with 0-few marginal filiform teeth or colleters to 3 mm long. Flowers homostylous, cymose from the axils on slender peduncles to ca 15 mm long, (2-)3(-5) flowers on shorter pedicels from each peduncle, often flowering at most axils. Calyx lobes lanceolate, 0.5-1.3 mm long. Corollas rotate or short funnelform, white or occasionally faint lavender or pink, 1-2 mm long, partly obscured by calyx lobes, corolla tube and lobes about equally long, throat with white hairs. Anthers 0.2-0.3 mm long, attached to lower part of tube. Stigma and style less than 0.5 mm long, style thickened. Mature capsules 1-2.2 mm long, 1.3-2.8 mm wide, subglobose or slightly wider than long, 4/5 to fully inferior, glabrous, truncate or retuse. Seeds numerous per capsule, 0.2-0.4 mm long, trigonous. Flowering all year in tropical climates. Chromosome number: n=9, 18, 27; 2n=18, 36, 54 (Lewis 1959, 1962, 1964, 1966b; and others).

Habitats: Disturbed places, lawns, roadsides. Distribution: Pantropic weed. United States: Mainly in Atlantic and Gulf Coastal Plains and Mississippi Embayment; South Carolina, southern Georgia, throughout Florida, southern parts of Alabama, Mississippi and Louisiana, and rare in eastern Texas. Becoming more common in continental U.S. Hawaii: Oahu, Hawaii, Maui. Also, West Indies and México: Nayarit, Tabasco, Chiapas; probably more common in México than indicated by available records. Standley (1918) did not list any records for México and United States, listing only West Indies, Central America and South America in the Western Hemisphere. Our plants are the diploid race of var. *corymbosa* (Lewis 1964).

2. *Oldenlandia uniflora* L., *Sp. Pl.* 119. 1753. TYPE: To be discussed in a separate paper. *Hedyotis uniflora* (L.) Lam., *Tabl. Encycl.* 1:272. 1792. *Edrastima uniflora* Raf., Actes Soc. Linn. Bordeaux 6:269. 1834.

Hedyotis auricularia Walter, *Fl. Carol.* 85. 1788. (non *H. auricularia* L., *Sp. Pl.* 101. 1753).

Oldenlandia glomerata Michx., *Fl. Bor.-Amer.* 1:83. 1803. *Hedyotis glomerata* (Michx.) Elliott, *Sketch Bot. S. Carolina* 1:188. 1816.

Stelmotis glomerata Raf., New Fl. 4:101. 1838. *Stelmanis glomerata* Raf., *Autik. Bot.* 13. 1840.

Hedyotis virginica Spreng., *Pl. Min. Cogn. Pug.* 2:34. 1815.

Hedyotis fasciculata Bertol., Mem. Reale Accad. Sci. Inst. Bologna 2:306. 1850. *Oldenlandia fasciculata* (Bertol.) Small, *Fl. S.E. U.S.* 1106. 1903. *H. uniflora* var. *fasciculata* (Bertol.) W.H. Lewis, Amer. J. Bot. 49:865. 1962.

Oldenlandia littoralis C. Mohr, Bull. Torrey Bot. Club 24:27. 1897.

Annual herb. Stems slender, erect, spreading or procumbent, to 4.5(-7.7) dm tall (sometimes flowering when plant very small), branched, densely white hirsute or pubescent to glabrous. Leaves sessile or short petiolate, ovate or elliptic, to 28 mm long, 3-11 mm wide, hirsutulous or pubescent to glabrous above or pubescent only on midrib and nerves, glabrous or pubescent on nerves beneath. Stipules to 2 mm long, with 1 to few, sometimes branched and ciliate linear or narrowly lanceolate marginal teeth, to ca 5 mm long. Flowers homostylous, sessile or on pedicels to ca 3 mm long, 1 to several in axillary and terminal glomerules. Calyx lobes ovate or ovate-lanceolate, 0.8-3 mm long, pubescent to glabrous. Corollas rotate, white or pale blue, inconspicuous, 0.7-1.3 mm long, usually shorter than calyx lobes. Anthers 0.1-0.2 mm long, attached to corolla tube at sinuses of lobes. Style and stigma 0.2-0.6 mm long; stigmas included in tube; style thickened. Mature capsules 1-2.5 mm long, 1-3 mm wide, subglobose or slightly wider than long, fully or 7/8 inferior, densely hirsute varying to glabrous. Seeds numerous per capsule, 0.2-0.3 mm long, trigonous. Flowering in United States in spring (Florida), summer, fall. Chromosome number: n=18, 36; 2n=36 (Lewis 1962).

Habitats: Wet or moist places, lake shores, swamps, stream banks and sand bars, pine and deciduous woods (often in openings), savannahs, fields, roadsides and gravel pits. Distribution: United States: Mainly in Atlantic and Gulf Coastal Plains and Mississippi Embayment; New York (Long Island), New Jersey, Delaware, Maryland (southeast and Prince Georges Co.), District of Columbia; eastern parts and rare in piedmont of Virginia, North Carolina, South Carolina (incl. Pickens Co.) and Georgia; throughout Florida, Alabama, Mississippi, Louisiana, eastern Oklahoma, eastern Texas, southern Arkansas, southeastern Missouri, western Kentucky and western Tennessee. Also occurs in the West Indies in Cuba, Puerto Rico and Jamaica.

There is some variation in leaf shape and plant vestiture, but these variants, to which names (see synonyms) have been given, definitely vary as continua and I have had no hesitation in sinking these into one species.

3. *Oldenlandia boscii* (DC.) Chapm., *Fl. Southern U.S.* 181. 1860. *Hedyotis boscii* DC., *Prodr.* 4:420. 1830. TYPE: UNITED STATES. Carolina: 1798-1800, *Bosc s.n.* (HOLOTYPE: G-DC [not seen]; Microfiche: US!).

Small perennial herb with woody taproot. Stems slender, spreading, decumbent or prostrate, to 3 dm tall, or forming mats to ca 4 dm wide, much branched, glabrous to minutely papillose or puberulent. Leaves sessile, linear to narrowly elliptic, to 30 mm long, 1-3(-5) mm wide, glabrous to minutely papillose or puberulent above, glabrous or scabrous on midrib beneath. Stipules to 2 mm long, with 1 to several narrow marginal teeth to 2 mm long. Flowers homostylous, sessile or subsessile, 1 to several in axillary and terminal glomerules. Calyx lobes triangular to lanceolate, 0.8-2 mm long, glabrous or minutely papillose. Corollas rotate, white, pink or lavender, very small and inconspicuous, to ca 0.7-1 mm long. Anthers 0.1-0.3 mm long, included. Style and stigma less than 0.5 mm long; stigmas included; styles thickened. Mature capsules 1.5-3 mm long, 1.5-2.5 mm wide, subglobose or slightly longer than wide, fully or 7/8 inferior, verrucose or papillose with minute rounded papillae, varying to glabrate. Seeds numerous per capsule, 0.1-0.3 mm long, trigonous. Flowering April to November. Chromosome number: $2n=36$ (Lewis 1962).

Habitats: Wet or moist places, stream banks, lake shores, roadsides, ditches, fields, woods, savannahs, disturbed open places. Distribution: United States: Mainly in Atlantic and Gulf Coastal Plains and Mississippi Embayment in the southeastern states, also in other physiographic provinces, including Ozarks; southeastern Virginia, North Carolina (one county in southeast), South Carolina (incl. Pickens Co.), southwestern (and one county in northern) Georgia, northern Florida, Alabama, Mississippi, central and western Tennessee, Louisiana, Arkansas, southeastern Missouri, eastern Oklahoma and eastern Texas.

Oldenlandia boscii does not seem to vary much in morphology over its range, in contrast to most other taxa in this and related genera.

4. *Oldenlandia salzmannii* (DC.) Benth. & Hook. f. *ex* B.D. Jacks., Index Kew. 2:336. 1894; Benth. & Hook. f., *Gen. Pl.* 2:58. 1873. *ined.* (see Fosberg & Terrell 1985). *Anotis salzmannii* DC., *Prodr.* 4:433. 1830. TYPE: "Bahiam," *Salzmann s.n.* (not seen). *Hedyotis salzmannii* (DC.) Steud., *Nomencl. Bot.*, ed. 2. 1:726. 1840.

Hedyotis thesiifolia A. St. Hil., *Voy. Distr. Diam.* 1:397. 1833. *Oldenlandia thesiifolia* (A. St. Hil.) K. Schum. *in* Martius, *Fl. Bras.* 6, 6:270, pl. 127, f. 1. 1889.

Small creeping perennial herb. Stems slender, prostrate, rooting at nodes, glabrous. Leaves sessile or subsessile, broadly elliptic to ovate, 1.5-5.2 mm long, 0.7-2.5 mm wide, glabrous to sparsely hirsute. Stipules to ca 0.5 mm long, entire or with 1 to few marginal white hairs to 0.7 mm long. Flowers heterostylous, solitary, terminal and axillary on slender pedicels 3-12 mm long. Calyx lobes lanceolate, ovate, or oblong, 1-2.2 mm long, glabrate. Corollas subsalverform, pink, lavender, purple or white, 2.5-5 mm long, tube 1-2.2 mm long, short and broad, densely hirsutulous or pubescent within: lobes ovate, equalling or longer than the tube. Anthers 0.5-0.8 mm long. Stigma branches (0.5-)1-1.5 mm long. Pin flowers with stigmas exserted 1-2 mm and anthers at distal end of tube; thrum flowers with anthers exserted on filaments 1 mm long and the stigmas included. Mature capsules ca 1.5 mm long and wide, subglobose, 7/8 to fully inferior, hirsute. Seeds ca 4-14 per capsule, 0.3-0.5 mm in diameter, trigonous. Flowering June to August, at least in western Florida and adjacent Alabama. Chromosome number: $n=15$, $2n=30$ (Lewis 1966a).

Habitats and distribution: South America: Brazil, Argentina. Uruguay, Paraguay. United States: Locally established, apparently accidentally, near Pensacola, Escambia Co., western Florida and in adjacent Baldwin Co., Alabama, in roadside ditch, by ponds and at edge of a marsh, where discovered by J.R. Burkhalter of Pensacola (Fosberg & Terrell 1985). The name, *O. salzmannii*, is here accepted as correct pending study of the type specimens.

5. *Oldenlandia callitrichoides* Griseb., Mem. Amer. Acad. Arts n.s. 8:506. 1863. TYPE: Discussed in pending publication, as noted below. *Hedyotis callitrichoides* (Griseb.) W.H. Lewis, Rhodora 63:222. 1961.

Small creeping perennial herb. Stems soft, thin, prostrate, rooting at nodes, glabrous. Leaves with slender petioles 0.5-3 mm long; blades thin, suborbicular, broadly ovate or subrhombic, 0.5-4 mm long, 0.5-4.8 mm wide, sparsely covered above with scattered stiff white hairs to ca 0.5 mm long or infrequently glabrate. Stipules minute, with 0 to few whitish marginal hairs. Flowers apparently homostylous, solitary from axils on filiform pedicels to ca 2 cm long. Calyx lobes lanceolate or ovate, 0.3-1 mm long, cilated along the margins and sinuses. Corollas subsalverform, white or lobes purplish tipped, 1.5-3.5 mm long, tube slightly shorter than lobes. Anthers 0.2-0.3 mm long, exserted at mouth of tube on filaments to 0.3 mm long. Style and stigma 1.5-2 mm long, with the stigma exserted to or beyond anthers. Mature capsules 1-2.7 mm long, 0.5-2 mm wide, narrowly turbinate or narrowly obconic, widest at apex, 9/10 to fully inferior, glabrous below ciliate calyx lobes, eventually splitting apart into 4 narrow segments. Seeds ca 20-35 per capsule, 0.3-0.5 mm long, ellipsoid, rhomboid or obtusely several angulate. Flowering September to January in Bahamas (Correll 1982). Chromosome number: $2n=22$ (Terrell, *et al.* 1986).

Habitats and distribution: Moist or wet soil in grassy places, disturbed places, on rocks and cliffs, lawns, walls, curbs, stonework. West Indies, Panamá, Yucatán. Adventive in Guyana; Sierre Leone in Africa; United States, Miami, Florida, at two locations: Vizcaya Art Museum on cement fountains and water channels; shaded, grassy place at Fairchild Tropical Garden; Hawaii: Oahu, Maui. As noted in Introduction, this species is being placed in a new genus by Terrell and W.H. Lewis.

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